Fishery management in Japan

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PREPARATION OF THIS PAPER

This document has been prepared as part of FAO's Regular Programme activities, aimed at assisting fishery administrators and other persons responsible for the management of fisheries. It is the sixth in a series of technical papers relating to the PRACTICES OF FISHERIES MANAGEMENT.

This paper was prepared by three authors of different specializations: Mr. Asada, for his expertise in Japanese licensing and regulatory systems; Dr. Nagasaki for his experience in biological aspects of both demersal and pelagic species; and Dr. Hirasawa as an authority on the Japanese fisheries system. The manuscript was edited by Mr. William MacKenzie, Consultant, Ottawa, Canada. Appreciation is due to Mr. R. Tanabe, Fisheries Agency of Japan, and Dr. S. Chikuni, Fisheries Department, FAO, for their assistance in the coordination and focus of the paper.

ABSTRACT

Management of fisheries encompasses inter-action between societal customs, fugitive resources and technology. Fisheries management in Japan consists of two basic types of management techniques: the use of fishing rights for delineating ownership over sedentary species in littoral zones and licensing systems where management regulations restrict the number and size of fishing vessels. Biological considerations are discussed and the coordination mechanisms required are described for blending resource characteristics with Japanese societal customs. An appraisal is given of the management measures adopted.

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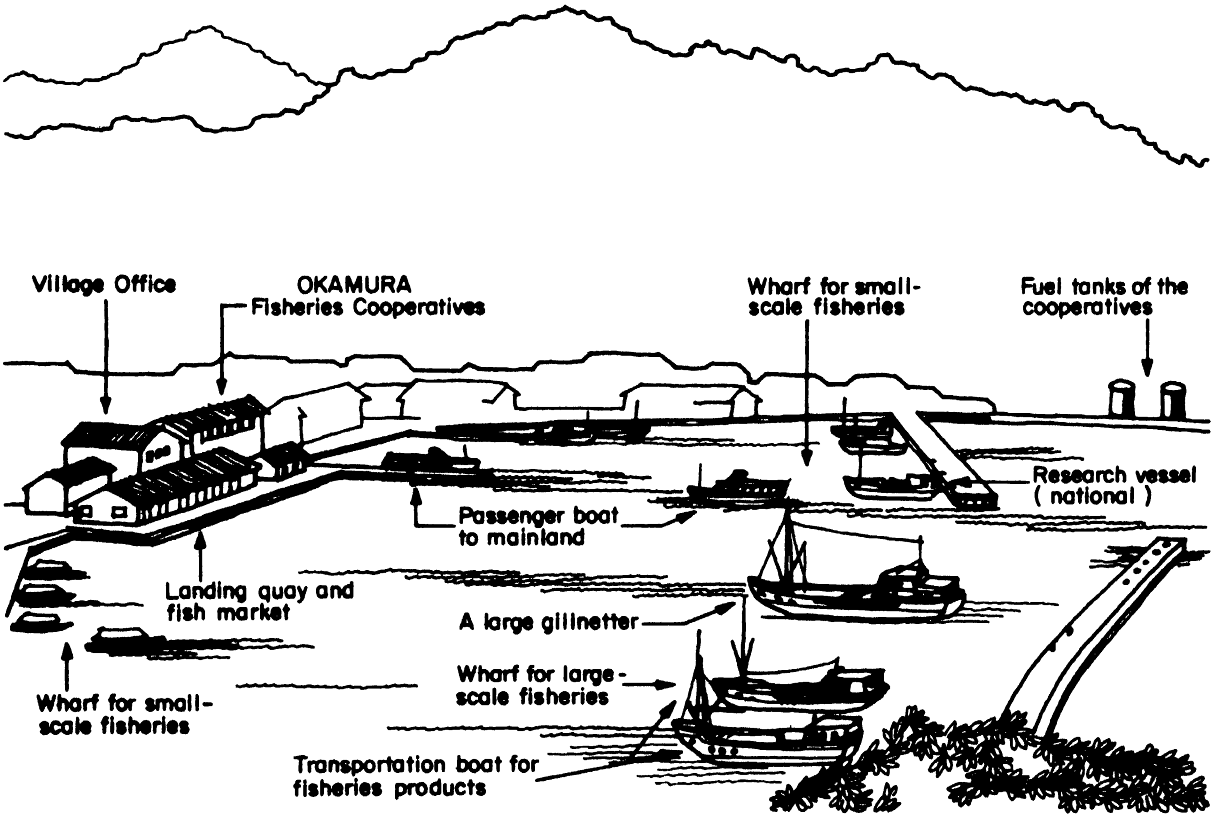
OKAMURA Island

A typical and well organized small fishing village on a small island in The Seto Inland Sea


Village Office
OKAMURA Fisheries Cooperatives
Wharf for small-scale fisheries
Fuel tanks of the cooperatives
Research vessel (national)
Passenger boat to mainland
Landing quay and fish market
A large gillnetter
Wharf for large-scale fisheries
Wharf for small-scale fisheries
Transportation boat for fisheries products

Key to Cover Photograph

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1. THE BACKGROUND OF THE FISHERY MANAGEMENT SYSTEM

1.1 Fishery Production

Japan's fisheries experienced rapid growth in the years following the 2nd World War and pre-war production levels were surpassed as early as 1952. Production increased steadily, reaching seven million tonnes per year in 1966, eight million tonnes in 1968 and 10 million tonnes in 1972. The latter level has been maintained despite the subsequent decline in distant-water fishing operations, as a result (especially since 1975) of restrictions on access to the Exclusive Economic Zones (EEZs) of other coastal states.

As shown in Table 1, annual production from distant-water fisheries declined by about 50 percent (from four to two million tonnes) between 1973 and 1979. During the same period, domestic offshore production rose from four to five and a half million tonnes but, although total supply has thus been relatively constant, there has been an important change in the species mix: higher-quality fish produced by distant-water fleets being replaced by catches of sardine and mackerel (the principal components of offshore production).

Production from the coastal or inshore fisheries (those using vessels under 10 tons in size or operating without fishing craft) has been stable at about two million tonnes annually. Shallow-water aquacultural production (mariculture) - including that of young yellowtail, scallops and oyster as well as laver and wakame seaweed (Undaria) - while fluctuating somewhat from year to year, has shown a gradually upward trend. Production from inland-water (freshwater) fisheries also, although small in absolute quantity, has been increasing slowly.

A breakdown by species of the 1979 catch of pelagic and demersal fish is shown in Table 2. Among pelagic species, the leaders are sardine and mackerel, followed in sequence by tuna, skipjack, saury and common squid. Of demersal fish, the dominant species is Alaskan pollock, taken in northern waters, followed by flatfishes and sandlance. A substantial part of the large sardine and mackerel catches is turned into fish meal while pollock is the raw material for fish paste. Sardine and mackerel, as well as sandlance, also are used as forage in aquaculture. A comparatively limited proportion of fish caught in large quantity is used directly for human consumption.

Table 3 provides a classification of the catch in 1979 by category of fishery (as defined by type of craft and/or gear used), area of operation (fishing ground) and species for which operations are primarily directed. Fisheries licensed by the Minister of Agriculture, Forestry and Fisheries are starred. All of these, excepting "offshore trawl" and "medium-to-large seine", are defined as distant-water (far-seas) fisheries. Such fisheries come under international management, more or less, and are thus subject to detailed individual regulation. Other fisheries are defined either as offshore or coastal and virtually all are licensed by prefectural governors or fishing-rights authorities.

In Japanese domestic waters, i.e. excluding distant-water production, the largest catch (at slightly over 2.4 million tonnes) is produced by medium-to-large-scale seiners, followed (at 0.9 million tonnes) by off-shore trawlers. Next in order are small-scale seiners (at 0.8 million tonnes) and beach fisheries (at 0.7 million tonnes). Fishing with set nets, small trawls, gillnets, jigs, dipnets and boat seines (with a combined catch of 1.9 million tonnes) also accounts for a significant production in volume terms. Altogether, the near-water fisheries of Japan produce 7.3 million tonnes of fish (including edible seaweed), of a total national production (1979) of nine million tonnes.

Catches from the waters around Japan may be divided into four species groups, viz. littoral, demersal, coastal pelagic and highly migratory. The littoral group includes various species of clams and other shellfish, sea urchin, sea cucumber and seaweeds. Demersal species include cod, pollock, flounders, rockfishes, croakers, sea breams, cuttlefishes, shrimps, crabs and various others. The coastal-pelagic group includes sardine, anchovy, mackerels, yellowtail, mullet, common squid and several other species. Saury and flying fish, although oceanic species actually, are also (for convenience) included in this group. Highly migratory species are those originating

Table 1 Japanese Fisheries Production

(x 10^3 tons)

	1973	1974	1975	1976	1977	1978	1979
Far sea fisheries	399	369	316	295	266	213	204
Off-shore fisheries	398	417	446	466	492	556	549
Coastal fisheries	182	187	193	200	211	199	195
Aquaculture	79	88	77	85	86	92	88
Inland fisheries	18	18	20	20	21	23	23
TOTAL	1 076	1 080	1 054	1 066	1 076	1 083	1 059

Table 2 Catch by Species (1979)

(x 10^3 tons)

	Pelagic Species		Demersal Species	
Ranking:	Species	Catch Volume	Species	Catch Volume
1	Sardines	1817	Pollock	1551
2	Mackerel	1414	Flounders	288
3	Tunas	362	Atka mackerel	118
4	Skipjack	346	Sandlance	110
5	Saury	277	Cod	91
6	Common squid	212	Crabs	80
7	Horse mackerel	183	Shrimp	52
8	Anchovies	134	Octopus	52
9	Salmon	104	Rockfish	40
10	Whitebait	55	Croakers	39
11	Round herring	49	Hairtail	30
12	Yellowtail	45	Sea breams	29
13	Billfish	43	Lizard fish	21
14	Salmon trout	26	Sharp-toothed ell	15
15	Mullet	11	Cuttlefish	14
16	Dolphin	9	Argentine	12
17	Sea bass	9	Sandfish	10
18	Flying fish	8	Idiot rockfish	10
19	Spanish mackerel	6		
20	Herring	6		

Table 3 Principal Fisheries and Their Catch Volumes (1979)

Type of Fishery	Catch	Area	Directed Species
Mothership dragnet*	542×10^3	Bering Sea	Pollock, flounders, cod, others
North sea trawlers*	563×10^3	Northern waters	Pollock, flounders, rockfish, cod
South sea trawlers*	222×10^3	New Zealand Atlantic Africa	Horse mackerel, common squid, hake, cuttlefish, hoki, loligo, butterfish, octopus
Western trawlers* (for water west of Japan)	199×10^3	South China Sea	Croakers, hairtail, sharptoothed eel, flounders, yellowtail, squid, shrimp, sea bream
Offshore trawlers*	192×10^3	Offshore Japanese waters	Pollock, Atka mackerel, flounders, cod, sandlance
Large-medium purse-seine*	$2\,441 \times 10^3$	Japanese waters	Sardines, jack mackerel, mackerel, tunas, other
Mothership salmon*	15×10^3	Northern waters	Salmon
Far seas tuna longline*	205×10^3	Pacific, Indian Ocean, Atlantic	Tunas
Near seas tuna longline*	24×10^3	Offshore Japanese waters	Tunas
Far seas skipjack pole and line*	197×10^3	South Pacific	Skipjack
Near seas skipjack pole and line*	143×10^3	Off-shore Japanese waters	Skipjack
North sea longline gillnet*	29×10^3	Northern waters	Cod, flounders, POP
Small-size trawlers*	355×10^3	Around Japan	Flounders, pollock, Atka mackerel, sandfish, hairtail, Argentine, sea breams, shrimp, octopus, squid, crab, others
Small-size purse-seine	811×10^3	Around Japan	Sardines, mackerel, anchovies, round herring, jack mackerel, yellowtail, Atka mackerel
Saury dip net	266×10^3	Offshore Japanese waters	Saury
Other square-netters	136×10^3	Japanese waters	Sardines, mackerel, sandlance, shrimp
Salmon driftnet	26×10^3	Off-shore Japanese waters	Salmon
Other gillnets	349×10^3	Around Japan	Pollock, flounders, cod, Atka Mackerel, mullet flying fish
Coastal skipjack pole and line	20×10^3	Around Japan	Skipjack
Squid jigging	334×10^3	Around Japan	Common squid
Other jigging	89×10^3	Around Japan	Skipjack, yellowtail, sea bream hairtail
Coastal tuna longline	24×10^3	Around Japan	Tunas
Other longline	94×10^3	Around Japan	Pollock, cod, sea bream octopus
Set nets	400×10^3	Around Japan	Salmon, tunas, sardines, mackerel, yellowtail, scallops, shrimp, squid
Boat seine	212×10^3	Around Japan	Sardines, anchovies, whitebait
Clam and seaweed harvesting, other	712×10^3	Around Japan	Clams, seaweed, shrimp, crab, octopus, sea urchins

* Asterisk denotes a minister-licensed fishery; others include governor-licensed and other

elsewhere which at some point in their cycle of migration enter and are caught in Japanese waters. They include tunas, skipjack and swordfish. Chum salmon, that are spawned in Japanese rivers and grow to maturity in the high seas, are also included in this group.

As shown in Table 4, the combined catch of littoral, demersal and pelagic species has been increasing steadily over the past decade. This growth has been clearly in response to an increase in fishing effort. Increases have been recorded in the catch of both demersal and pelagic species, but, in the case of the former, restrictions imposed in the EEZ of the U.S.S.R. since 1977 inevitably have led to reduced catches. In the case of the pelagic group, the gains clearly have resulted from an increase in the sardine resource and the capability of mackerel stocks to sustain intensified exploitation. The catch in littoral fisheries has tended to decline, owing to reduced resource availability as a result of environmental deterioration in the vicinity of beaches, e.g. around Tokyo Bay, Isa Bay and the Inland Sea. On average for the decade, total fishery production (in physical-volume terms) has been divided among the three major sources, i.e. pelagic, demersal and littoral fisheries, in the proportions of 60, 30 and 10 percent, respectively.

Needless to say, the strongest influence on fishery bio-production in Japanese waters is the warm Kuroshio current, which flows with considerable energy from south to north, together with the cold Oyashio current carrying abundant nutrients from the north. Pelagic species such as sardine, anchovy, mackerel, tuna, saury, yellowtail and common squid spawn in the warm coastal waters influenced by the Kuroshio, waters which also provide favourable conditions as nursery grounds for juvenile fish. The waters referred to are found to the west of Chiba Prefecture on the Pacific side of Japan and to the west of Noto Peninsula on the side of the Sea of Japan, reaching as far south as the East China Sea.

In short, the southern half of Japanese coastal waters is the area of origin for a variety of pelagic species and so vitally important for fishery production. Members of the species involved also are carried to northern waters by the Kuroshio and Tsushimo warm currents. The shifting movements of these two currents, therefore, are highly critical for the survival of eggs and larvae. Relevant oceanographic conditions are favourable in this respect for some species in certain years and unfavourable in others. Consequently, as may be observed from past catch records, the production of pelagic stocks tends to show significant year-to-year fluctuation.

Fish stocks originating in warmer waters gradually extend their distribution northwards toward the polar front or beyond, where active feeding and growth take place. The fishing grounds for mature fish, therefore, generally are located north of the reproduction area. Most catches of sardine, mackerel, saury and common squid are taken from waters off Hokkaido and the Sanriku district. Broadly speaking, the waters west of Chiba Prefecture and the Noto Peninsula may be designated the reproduction area and those off Hokkaido and Sanriku the harvesting area for pelagic fishes.

The coastal waters around Japan may be divided into regions as follows: northern, central and southern Pacific, northern and western Japan Sea, East China Sea and Seto Inland Sea. Of the combined three years' (1975-77) catch of coastal pelagic fish, about 55 percent came from the Pacific regions, 41 percent from the Japan Sea and East China Sea and four percent from the Inland Sea. Among the above-mentioned regions separately, the largest portion, amounting to 32 percent of the whole, came from the northern Pacific region, followed by 20 percent from the East China Sea. On the Pacific side, supplies are plentiful in the north and scarce in the south; on the side of the Japan Sea, the reverse is the case.

The continental shelf of Japan is limited in extent and thus not particularly conducive to the production of demersal species. Waters of 0 - 200m in depth cover an area of only 423 000 km^2, less than 10 percent of Japan's 200-mile zone (EEZ). The production of demersal fish tends to be concentrated in the waters off Hakkaido and Tohoku, where the shelf is relatively broad, and to be greater on the side of the Sea of Japan than on the Pacific side. Catches per unit area also are higher on northern fishing grounds than on those of the south. This pattern correlates with a difference in fishing methods as between north and south: 80 percent of the demersal fish taken off Hakkaido is caught by trawlers, whereas the trawlers' share of the catch from the southern Pacific region is not

Table 4 Catches by Group in Japanese Waters (1968-1977)

(x 10^3 tons)

	1968	1969	1970	1971	1972	1973	1974	1975	1976	1977	10-Year Annual Average (%)
Pelagic Species	2,786	2,511	2,695	2,803	2,748	3,011	2,922	3,179	3,160	3,936	2,975 (59)
Demersal Species	1,307	1,215	1,445	1,523	1,503	1,373	1,681	1,790	1,793	1,729	1,535 (30)
Beach Species	607	600	571	576	577	519	542	542	607	589	573 (11)
Total	4,700	4,326	4,711	4,902	4,828	4,903	5,145	5,511	5,560	6,254	5,084

more than 50 percent and of that from the western Kyushu only 32 percent. On the southern grounds, catches of commercially valuable fish are made on an ecologically selective basis through the use of a variety of gears, e.g. set-nets, bottom gillnets [illegible] longlines as well as trawls.

1.2 History of Fishery Management

In the management of fishery resources and of fishing activities, two types of regulatory regime are to be distinguished. For the exploitation of seaweeds, shellfishes, crustaceans or other sedentary fishes, it is possible to delineate water areas and (as with farmland) to define owners and users. In the case of migratory fishes, however, designating areas and fixing boundaries are not conducive to increasing production. In cases of this kind, management regulations may take the form of restrictions on the number and size of vessels in operation. In what follows, the first approach to fishery management will be referred to as A-type management and the second as B-type management, corresponding respectively to the common fishing-rights and the licensing systems prevailing in Japan.

When a resource is owned by a specific entity or person, the latter is naturally concerned with its husbandry and even with its enhancement. A-type management, therefore, is very effective for fisheries based on littoral resources. Among its advantages is that it tends to maximize productivity. In the absence of resource ownership, competition among fishermen (fishing enterprises) may result in over-exploitation of fishery resources. B-type management, moreover, cannot protect the interests of fishermen who are competitively weak.

With A-type management, problems arise in the delineation of areas of operation (allocation of access to resources). This type of management favours communities with long coastlines and small populations - those where conditions are the reverse are correspondingly at a disadvantage. Inequities in the availability of fishing grounds are liable to result. Moreover, if resources are not fully utilized, the rental of access may lead to a form of absentee landlordism.

Japanese fishery policy in feudal times classified coastal villages as "agricultural" and "fishing" villages. In those of the former category, fishing operations in adjacent waters (excepting the harvest of seaweeds for fertilizer) were prohibited. It was reasoned that, if fishing activity were permitted in agricultural villages, farming would decline. Since fisheries promoted a money economy, freedom to switch from farming to fishing would have shaken the rice-based feudal economy. For that reason, only villages with small amounts of farmland, where fishing alone offered a viable livelihood, were allowed to participate in the fisheries. Fishing rights were awarded to such communities. Because the numbers entering the fishery from any particular community had to be limited, to ensure equity and viability, fishermen's guilds came into existence.

As the feudal era drew to a close, in the middle of the 19th century, population increased in coastal agricultural villages and, under the impetus of a cash economy, there arose a concomitant effort to develop commercial fisheries in these places. The trend became extremely difficult to supress. The demand strengthened, that is to say, for an A-type as opposed to B-type fishery management. Serious disputes over fishing grounds consequently began to occur between coastal agricultural and fishing villages.

With the breakup of the feudal system in 1868 and the development of fisheries in agricultural communities, along with internal conflicts in fishing villages and the entry of new fishing ventures backed by outside interests, concord in fishery operations broke down. In 1887, the Japanese government drew up regulations covering fishermen's associations which, following existing custom and practice, sought to maintain harmony within fishing communities. Although the authorities aimed at preserving B-type management, the vigorous movement toward an A-type approach proved impossible to repress.

Repeated trial and error finally led to the enactment of a Fisheries Law in 1902. This legislation provided for the establishment of fishery associations in each fishing village and assigned fishing rights to them. The law later became the basis for current fishery-managements, including in particular the common fishing rights system. Under this system, however, fishing grounds tended to be very narrow in area, and, since the law respected past customs, there were many instances where fishermen in one village were granted rights on grounds belonging to another.

The year 1907 marked the start of fishing-vessel motorization. With the onset of the 1920s, highly efficient offshore fishing craft began to fish in coastal waters, causing serious conflicts with inshore fishermen. Economic strains in fishing communities, brought on by the great depression of the 1930s, intensified these conflicts. At this juncture, as a means of stabilizing the livelihood of coastal fishermen, a movement arose to extend common fishing-rights grounds further offshore and to concentrate all fishing rights (including the demarcated and set-net rights) in the hands of fishery cooperative associations. The intention was to keep large offshore vessels out of the grounds involved in order to conserve fishery resources, thereby expanding application of the A-type concept, and to strengthen fishermen's associations as the main agency of fishery management.

From 1902 onwards, the waters adjacent to a fishing village increasingly came to be viewed as the property of the local fishermen's cooperative organization. The fish marketing activities of these organizations, which took business away from middlemen, were supported by the Japanese government during the crisis-laden period of the 1930s. In 1946, following World War II, a major revision of fishery legislation was carried out by the government, the objective being to expel absentee owners from fishing villages and reserve fishing rights exclusively for working fishermen. Based on a concept of developing fishery production through democratic exploitation of fishing grounds, the intent was to legislate the principle of "all fishing rights to the fishermen's associations".

The Allied Occupation authorities then in control, however, strongly advocated that actual fishing operators be given priority. For that reason, fisheries directed to migratory species were not included in the fishing rights scheme but were made subject to licensing. The band of waters (seaward from the shoreline) under common fishing rights, it was insisted, should be narrowed and open fishing grounds should be extended as widely as possible. Although B-type management generally favours the economically strong enterprises and results in over-exploitation of fishery resources, the occupation authorities judged that this negative aspect of the arrangement could be eliminated by area adjustments under the control of a newly established fishery coordinating committee and the implementation of a licensing system.

The present fishery law, therefore, reflects a compromise between A-type and B-type systems of management. By repudiating the concept of "all fishing rights to the fishermen's cooperative", excluding migratory species from common fishing rights, restricting the area of application of these rights and broadening the area subject to fishing licences, the law represents an approximation to B-type management. On the other hand, inclusion of set-net and of (beach and boat) seine fisheries under common fishing rights, expansion of the scope of ownership and administration of such rights by fishermen's groups and bestowal on these groups of top priority in the award of fishing licences all imply retention in the law of an A-type management component.

Thirty years have passed since revision of the Fisheries Law, with no major modifications in the interim. In actual application of the law, however, it is clear that the A-type philosophy has gained strength in recent years. In addition to common fishing rights, by amendment of the law in 1962, aquacultural rights have been placed under the control of fishermen's cooperatives. As a result, private or corporate ownership in aquaculture is now quite restricted. Furthermore, with the passing of each 5-year licensing period, the incidence of ownership in the set-net fisheries by fishermen's associations or groups increases while that by individuals and corporations declines. This is because fishermen's groups today, in contrast with 30 years ago, have considerably greater ability to raise capital for investment and possess a much higher level of technical capability.

2, AN OUTLINE OF THE FISHERY MANAGEMENT SYSTEM

2.1 The Current System

The existing system of fishery management in Japan is built around the Fisheries Law together with the following related laws, a) the Fisheries Resources Conservation Act, the objective of which is the conservation and propagation of fishery resources, b) the Law of Fisheries Cooperative Associations, which is the basis for the present deployment of fishermen, and c) certain other relevant laws as well as regulations and ordinances based on the already-mentioned statutes. The Fisheries Law, which provides a foundation and framework for fishery production in Japan, is constructed of measures relative to fishing rights, fishery licensing and arrangements for fishery coordination (coordinating committees) designed for the democratic implementation of the measures referred to.

The fishing-rights system governs the utilization of coastal fishing grounds on the basis of historically established exclusive rights for particular fisheries in specific waters. In the coastal fisheries, some fishing gears require an exclusive right for their use and some require collective control by the fishermen concerned. The fishery-licensing system is designed for the selection of participants and for restricting or prohibiting fishing and related activities where there is need for such controls, a) to conserve or propagate fishery resources or b) to regulate fishing operations for other purposes. Excluding fisheries based on fishing rights, almost all Japanese fisheries, from coastal to off-shore and distant-waters, come under the licensing system. The only exemptions, i.e. fisheries in which operations are free of regulation, are pole and line fishing by small vessels in coastal waters.

The system of fishery coordinating committees is designed to assure democratic implementation of the fishing-rights and licensing systems. The system embraces a number of sea-area coordination committees and a central coordination council. Sea-area committees are set up in 66 fishing areas, established by the Minister of Agriculture, Forestry and Fisheries (in principle, one area for each prefecture). These committees consist primarily of fishermen's delegates elected on a district basis, together with knowledgeable experts and persons representing the public interest named by the prefectural governor. Each committee has substantial authority as the advisory body to administrative agencies responsible for the granting of fishing rights and licences within an area. The committees also have broad directive powers, when requested, to determine limits on fishing operations and the utilization of fishing grounds. Similar committees perform the same functions in inland-water fisheries.

In order to settle problems involving two or more areas, there are provisions for the establishment of joint sea-area fishery coordination committees. Three such joint committees have been established on a permanent basis for locations where fishing grounds are exploited by fishermen from several different areas.

The Central Fisheries Coordination Council, consisting of fishermen's delegates and experienced specialists, considers important matters relating to the implementation by the Minister of the fisheries law and fishery licensing policy. Issues of importance with regard to fishery regulation also are considered.

The Fisheries Resource Conservation Act is designed to maintain the abundance of fishery resources through measures for their conservation and propagation. Since this is a very important aspect of fishery policy, provisions of the former fisheries law concerning conservation and propagation are now incorporated in a separate statute. The objectives of the Act, however, are still to a large extent realized by means of the current Fisheries Law. The Conservation Act provides for measures by the Central Government a) to restrict or prohibit the harvest of fishery resources, to control the use of fishing gear, to prevent harmful fishing methods and to fix fleet size and catch quotas, b) to establish protective waters in vital spawning and nursery areas, c) to enhance resource stocks, e.g. the artificial propagation of anadromous species, and d) to foster the conduct by government of scientific research.

The Coastal Fishing Grounds Development Act, which came into force in recent years, provides for fishery limits and other measures to improve coastal fisheries.

The Law of Fisheries Cooperative Associations is designed to promote cooperative organization among fishermen and fish processors and, through such action, to increase fishery production and better the economic and social position of fishermen. The fishery cooperative associations are corporate juridical persons established to serve fishermen directly through activities like marketing, purchasing, obtaining credit and providing health, welfare, education and information services. To that extent, they are not different from cooperative associations in other industries. The special role of the fishery cooperatives lies in the field of fishery management, i.e. their administrative authority over fishing rights.

Fishermen's groups were formed originally for the collective management of coastal fishing grounds. Later their functions extended into the economic area and finally they evolved into the present type of cooperative association. With that historical background, qualification for membership is defined very strictly. The association's decision-making process also is specified in detail. Although, by the nature of such organizations, adherence to and exit from an association is voluntary, almost all fishermen in fact belong to them. Every fishing village has such an association. The number of these district cooperatives is in excess of 2 200. In addition, some 300 cooperatives are organized by type of fishery.

Japanese fishery policy lays great stress on the management of fishery resources and fishing grounds by fishermen themselves, which is viewed as rational and desirable, and seeks to ensure implementation of this approach on a democratic basis. In this respect, the cooperative associations play a leading role in fishery management.

2.2 Fishing Rights

The "Fishing Rights" system applies only to coastal fisheries. In these fisheries are found many enterprises using stationary gear, e.g. set-net, bottom-fixed net, etc., as well as aquacultural enterprises. The viability of such an enterprise depends on its receiving legal protection from encroachment by others on its site of operation. In the absence of this kind of arrangement, competition between fishermen results in serious conflict. As in the case of rights to the use of land for productive purposes, therefore, fishing rights are considered as "rights in rem". Thus, on a fishing ground managed under this system, no one other than the holder of the right to it may conduct fishing operations. A ground cannot be reclaimed without the holder's approval: purchase of the right from the holder is necessary even for reclamation by the Government.

There are three kinds of fishing rights, viz. common, demarcated and set-net rights. The most important are common fishing rights, which are awarded only to fishery cooperative associations. As a rule, they are established for waters adjacent to the village where the cooperative is located. Common fishing rights are established for four classes of fishery viz:

a) fisheries for seaweeds, shellfish, crustaceans and sedentary finfish species

b) fisheries employing fixed gear, e.g. traps and the like

c) beach seine, boat seine and other fisheries which are relatively immobile or stationary on the fishing ground, and

d) inland-water fisheries.

The width of the zone governed by these rights varies considerably from one place to another, but the average is about one km seaward from the shore.

Demarcated fishing rights are granted for aquacultural operations. They are established within waters governed by common fishing rights and are divided into two types. One type is held by the cooperative associations concerned and relates to aquaculture using sea-ponds, rafts, nets and longlines. Since the operations involved are comparatively small in scale, the number of fishermen capable of participating is potentially large. To avoid conflict and effect efficient management, the right to conduct such operations is awarded to the cooperative rather than the individual members. The other type of demarcated fishing right is granted for pearl culture and large-scale aquacultural projects involving the partitioning of sea inlets by dikes or nets. Rights for these projects are awarded not only to cooperative associations but also to private companies and individuals with the technical capability and investment capital required.

Set-net fishing rights apply to the use of large-scale nets of this type, fixed in depths of more than 27m. Small-scale set-nets, the use of which is included under common fishing rights, often require to be moved from place to place to secure a catch. To equalize opportunity among participants, therefore, the cooperative customarily reallocates the placement of these nets each year by means of a lottery. In the case of large set-nets, however, because of a potentially substantial impact on other fishing operations in their vicinity, placement must be permanent. For that reason, they are excluded from coverage under common fishing rights.

In summary, fishing rights are divided into two categories. The first category includes common fishing rights, which relate to various small-scale coastal fisheries, and the demarcated fishing rights owned by cooperative associations of fishermen. These are called cooperative-managed fishing rights. Although the associations are granted the rights, they seldom engage directly in fishing operations. Their function is to own the fishing rights and to administer use of the fishing grounds in the interest of optimal utilization of fishery resources and of equal opportunity for their members. Equality of opportunity, however, is not always achieved. Within a cooperative, fishermen are apt to form groups based on type of fishery and fishing rights actually may be exercised by limited numbers. In any event, the rules for fishing-ground utilization are decided by a 2/3 majority vote at a general meeting of each association.

The second category of fishing rights includes the demarcated and set-net fishing rights awarded to individuals and companies as well as cooperative associations. Because of the extent of capital investment and the technical capacity required for the operations involved, the restriction of these rights to cooperatives might lead to the leasing of fishing rights. This would be contrary to the spirit of the Fisheries Law, which aims at the democratic utilization of fishing grounds. Even cooperative-managed fishing rights cannot be leased by the holder to others.

To avoid controversy in the distribution and allocation of cooperative-managed rights, practical implementation is left to the associations. With regard to other fishing rights, some criteria for qualification and the preferential ordering of allocations are needed. Large fishing companies and persons who are not working fishermen, along with those who violate fishing and labour laws, are disqualified. The preferential order is somewhat complicated but generally follows the sequence of a) fishery cooperative associations, b) organizations composed of many fishermen, c) fishermen's organizations with a limited number of members, d) individuals and companies (see Table 5).

2.3 Fishery Licensing

When it becomes necessary, for the purpose of resource conservation and/or the maintenance of orderly operations, to impose restrictions on effort in fisheries based on migratory fish stocks, the fishery in question is placed under a system of licensing. Unlicensed persons are not permitted to enter such a fishery. This system had its start in the trawl fisheries and, in pace with progress in motorization of fishing vessels, gradually has been applied throughout the primary sector. At present, almost all Japanese fishing-vessel operations come within the scope of the licensing system. In accordance with the size and operating conditions of the fishery involved, licences are divided between those granted by the Minister of Agriculture, Forestry and Fisheries and those issued by prefectural governors.

Table 5 Number of Large Salmon Fixed Nets, by Type of Ownership, in the Hokkaido Area

	1968	1973	1978
Total	586	579	780
Owned by:			
Individuals	244	142	66
Fishermen's Cooperatives	64	58	123
Fishermen's Groups	31	36	44
Corporations	44	52	179

NOTE: The majority of the corporate owners are made up of fishermen's groups that have incorporated. There has been a sharp decrease in corporate operations by fishing companies and individually owner companies.

(a) Fisheries Licensed by the Minister

Fisheries requiring licences from the Minister of Agriculture, Forestry and Fisheries are called "designated fisheries". As shown in Table 3, there are 13 fisheries in this category. In the case of fisheries regulated on the basis of international agreement or widely ranging in operation, coordinated regulation by the Central Government is considered to be necessary. The Minister, in consultation with the Central Fishery Coordination Council, specifies such fisheries by administrative edict.

The Procedure for the licensing of designated fisheries is typical of the Japanese fishery licensing system. First, consideration is given to the abundance of the relevant resource and to operating conditions in the fishery. So long as the public interest is not adversely affected, an overall allocation is established as deemed appropriate for the conservation or enhancement of resources and the maintenance of order in the fishery. Next, within this overall allocation and with due weight being given to the number of operators and to the conditions in which they operate, a determination is made of the number of vessels to be licensed: by tonnage class, fishing area and operating season. This is discussed with the Central Coordination Council and, with the Council's consent, allocations are announced by vessel size, fishing area and season. In principle, announcements are made three months in advance of the deadline for receipt of applications.

Applications for licence must be supported by proper credentials. The administrative agency reviews an applicant's qualifications and then issues a licence based on specific criteria. Licences are issued for both applicant and fishing vessel. Qualifications are evaluated on the basis of criteria set by the Fisheries Law, e.g. that the applicant intends to obey the spirit of the Law and regulations on fishing and labour conditions, that his vessel meets stipulated conditions and that he possesses sufficient capital for operation in the fishery involved. Licences are awarded on a priority basis to applicants with experience in that fishery.

If the number of experienced applicants exceeds the announced number of vessels, a selection is made with reference to such criteria as the applicant's previous operating history and his degree of dependence on the said fishery. In making this selection, the opinion of the Central Fisheries Coordination Council is taken into account. On the other hand, if the annual allocation is in excess of the number of experienced applicants, thereby permitting the participation of new entrants, an assessment is made as to :

i) whether those engaged in this particular fishery desire self sufficiency

ii) whether they are attempting to stabilize or rationalize their business enterprise and,

iii) whether a transfer to this fishery would be effective in conserving resources for other fisheries or result otherwise in improvement for the coastal fisheries.

The procedure, again, is followed through in consultation with the Council.

In principle, taking into account the return on invested capital, the licence period is set at five years. Licences for all fisheries thus are renewable simultaneously every five years. This policy of general turn-over is intended to allow for the possibility of switches between fisheries. In fisheries where catch quotas are decided annually on the basis of international agreement, however, the licence period is one year, i.e. licences are renewable each year. The procedure as just outlined applies to renewals based on official announcements. Nevertheless, licences are exceptionally renewable in certain circumstances. If, for example, a licensee has died or has liquidated or merged his operation (enterprise), his heirs or successor, upon notification, may continue operating under the existing licence. Also, if a licensee's vessel has sunk or has been withdrawn from service in the fishery, and an application is made for the same type of vessel as replacement, the previous licence may be retained as a special case.

In the event of a transfer of ownership of a licensed vessel, an application for extension of the licence generally would not be approved - in view of the principle of licensing based on public notification - but a licence may be granted exceptionally, (i) if a licensed vessel owner, in the interest of operational stabilization or rationalization, is seeking a joint venture with an operator or employee in another fishery or, (ii) if an application is being made for purposes of incorporation or enlarging the size of a vessel within the range established by law for total gross tonnage in that fishery. In addition, licensing exceptionally may be permitted if a fisherman in a particular fishery wishes to conduct independent operations therein or if an applicant is transferring from another fishery where an urgent need for transfer is recognized.

Observation of the actual operation of the licensing system during the period of a fishery's expansion indicates that the transfer of licensed vessels is countenanced for purposes of management stabilization and rationalization. The licensing of increased vessel capacity (tonnage) is treated as a special case and, given the provisions for change in licensing criteria, has afforded vessel owners a unique opportunity to enlarge the size of fishing craft.

Beside the licensing system for designated fisheries as outlined above, there are several other fisheries that are subject to ministerial purview and administrative order. These are fisheries that, from a national perspective (owing to their wide range of operations), must be managed on a consolidated basis but in which conditions do not warrant control as stringent as the imposition of a licensing system. Four types of vessel are included, e.g. those operating with stick-held dipnets for saury and those over 30 tons jigging for squid. The permisssion of the Minister is required for operation in such fisheries and restrictions are placed on operating season and fishing grounds.

(b) Fisheries Licensed by Prefectural Governors

When there is a need, from the standpoint of resource conservation or fishery regulation, to restrict the catch and/or effort in local fisheries (in which, for the most part, small-scale vessels are employed), there exist arrangements for the issuance of licences by prefectural governors. Fisheries so licensed (called governor-licensed fisheries) are divided into two broad classes for administrative purposes:

i) In the first class are those fisheries in which operations center mainly in the coastal waters of a particular area, i.e., a prefecture or metropolitan district. When restrictive regulation is required, the Prefectural Governor, with the approval of the Minister of Agriculture, Forestry and Fisheries, may establish his own fishery-adjustment regulations and institute a licensing procedure. The fisheries coming under this sort of arrangement are numerous and varied. In fact, nearly all major coastal fisheries are subject thereto.

ii) The second class embraces coastal fisheries that, owing to a wide operational range and relatively high productive capability, require coordination across two or more prefectures. In such cases, according to the Fisheries Law, the Prefectural Governor concerned is required to declare the fishery a governor-licensed fishery and the Minister establishes a fixed allocation by area, restricting the number and type of fishing vessels that may be licensed. This class of fishery is termed a legislated governor-licensed fishery, i.e. a governor-licensed fishery as determined by statute. The class at present includes four fisheries, e.g. medium-sized seiners (five tons and over, but generally not exceeding 40 tons) and small trawlers (under 15 tons).

The method of licensing for both of the preceding classes of fishery is almost identical to that prevailing in the case of Minister-licensed fisheries. Licences are issued for vessels and fishermen. The procedure and criteria for selection among numerous applicants follow those established for fisheries under ministerial licensing. Eligibility is examined and licences are awarded on a priority basis. In the case of governor-licensed fisheries, however, the functions exercised in the former instance by the Central Fisheries Coordination Council are here exercised by Area Fisheries Coordination Committees.

c. Various Restrictions and Prohibitions

While fishery licensing is designed basically for the maintenance of order and efficiency in fishing operations, licensing provisions may contain restrictions or prohibitions for purposes of resource conservation. The following are some important examples.

i) In the case of fisheries having a highly productive capability, e.g. those using bottom trawls or purse seines, comparatively wide areas near shore may be closed to fishing operations. For the same purpose, i.e. the conservation or propagation of resources, areas of operation may be restricted for various other fisheries.

ii) Most fisheries, e.g. off-shore trawl, small-trawl, purse-seine and stick-held dipnet (saury) fisheries, are subject to closure of the fishing season.

iii) Restrictions in force on vessels and gear include those on the horsepower of small trawlers, on mesh size and the member of tan (a unit of net) in drift-nets for salmon and on the intensity of fish-collecting lights in purse-seine fishing.

iv) Other provisions include restrictions on catch limits for particular species, restrictions on the body size of individuals of a species taken or landed, the prohibition of landings at other than designated ports and so on.

3. THE BIOLOGICAL BASIS OF FISHERY MANAGEMENT

3.1 Management and Utilization of Coastal Pelagic Species

From the viewpoint of resource management and utilization, the coastal pelagic fishes can be divided into two groups, viz. plankton feeders and fish eaters (predators). The former group includes sardine, anchovy, mackerel, horse mackerel, saury and common squid, all of which feed mainly on plankton. In general, being located at a low trophic level, species of this group are found in relatively great abundance. The predator group, on the other hand, including yellowtail, Spanish mackerel and dolphin fish, are located at higher trophic levels and feed mainly on other fish. They are relatively low in abundance but their populations are more stable than those of the plankton feeders.

Plankton feeders account for over 95 percent of the combined catch of coastal pelagic fishes. Since they congregate in dense schools, they can be caught effectively in large volume by means of gear such as purse seines. Predator species are taken with a variety of gears but in limited quantities.

a. Abundant Pelagic Species

Stocks of the "abundant" pelagic species are subject to wide fluctuation over time in actual abundance, due to a high mortality rate in the younger stages. Various kinds of fluctuation are observed: some long-term (extending to several decades), as in the case of sardine and herring, and others short-term (even year-to-year), as in the case of common squid. These fluctuations tend to correlate with natural causes rather than with fishery exploitation. Over-exploitation or depletion by fishing has not been a matter of serious concern with reference to abundant pelagic species - no one believes, for example, that Hokkaido herring and Japanese sardine were depleted by fishing. It is generally understood that the impact of fishing on stock size, if any, is likely to be masked by a larger natural fluctuation. Prediction of the magnitude of such natural fluctuations well in advance of a fishing season is thus a matter of urgent concern.

As already described, variations in the catch of individual species are smoothed out when catches of several species are combined. A particular environmental condition may have a favourable effect on some species and an unfavourable one on others, leaving the whole more or less stable. Species interaction has been indicated in a number of instances, e.g. a gradual decrease in anchovy abundance may be related to a sharp increase in the size of the sardine stock. A fairly significant negative relationship has been observed between the catches of horse mackerel and mackerel in Tsushima Current waters. The horse-mackerel catch in the East China Sea was raised by purse seining after 1959 and maintained at a high level until 1966, since when it has fallen rapidly. The mackerel catch, on the other hand, has risen since 1968, replacing that of horse mackerel. Since the spawning season and area for the two species overlap to a considerable extent, some competition between them may be assumed. Mackerel and saury both feed on the cold-water zooplankton in the waters off northern Honshu and Hokkaido, and a negative relationship can be clearly identified in the catches of these two species from those waters.

In utilizing abundant pelagic species, diversified fisheries directed to the capture of several species can operate with greater stability than specialized fisheries concentrating on a single species. Pelagic fisheries actually have been moving in this direction, and most catches of these species are now taken with purse seines.

For many species of this group, the yield/effort curve tends to be flat-topped. This means that the ultimate effect of mounting exploitation, i.e. a decline in catches, may be protracted. The result sometimes is a serious depletion of spawning stock. Even for abundant pelagic species, removal of spawning stock may have an adverse effect on normal reproduction when that stock has fallen to a low level from natural causes of one kind or another. Some scientists believe, for example, that depletion of the Norwegian herring resource resulted from intensive fishing for reduction purposes. It is particularly important, therefore, that the size of spawning stocks be protected. That is why some Japanese coastal waters are closed to large-scale purse seiners.

The gain in yield per recruit for these species, however, does not justify the introduction of size limits on individuals landed. Sardine and anchovy yield a higher commercial value at the post-larval stage than when older and are fished and utilized from that stage onward.

In brief, assurance of normal reproduction is given preference over yield-per-recruit considerations in management of the use of abundant pelagic species. Effective measures should be taken, however, to maintain stocks of post-larval fish, since these are vitally important as food for valuable predator species.

b. Predatory Pelagic Species

As stated previously, a long life-span and stable stocks at a relatively low level of abundance are typical of species in this group. In this respect, they resemble demersal species. On yield-per-recruit grounds, therefore, size limits or a prohibition on the catching of young fish would have merit. No effective measures of this kind have ever been introduced in Japan, however, partly because these fishes are caught by a number of different gear types. Yellowtail, for instance, are taken mostly with set nets but substantial catches are also made with lines, purse seines and gillnets. Spanish mackerel too are caught with set nets, lines, purse seines and gillnets, and dolphin fish are no exception. Fortunately, excepting yellowtail, the stocks of all these are in good condition so far. Due probably to the removal of large numbers of juvenile yellowtail for fish-cultural purposes, the catch of large members of this species has declined on the Pacific side of Japan. Effective measures of conservation are urgently needed for this stock.

c. Conservation Measures

The stocks of coastal pelagic species migrate widely around the Japanese Islands and, therefore, their management should be vested in the Central Government. As shown in Table 6, the great bulk of the catch from these stocks is taken by purse seiners of various sizes. Of the total catch of 13 species, purse seining accounts for 73 percent. As regards major species individually, the ratios are 90 percent for mackerel and 83 percent for round herring. Consequently, management of the fisheries for these species could be effected through direct control of seining operations alone. As explained earlier, however, there has been no need so far to impose catch quotas or size limits for abundant pelagic species. Restraint on effort, i.e. control over the number of vessels through

Table 6 Catches of Coastal Pelagic Fishes by Fishing Gear and Species (1979)

(x 10 tons)

Fishing Gear	Sardines	Round Herring	Anchovy	Larvaes	Horse Mackerel	Mackerel	Saury	Yellow-tail	Spanish Mackerel	Dolphin Fish	Flying Fish	Mullet	Squids
Purse seine 1/ (large-medium)	1,105	13	9		133	1,065		+					
Purse seine (small)	511	28	52		32	127		10	+			+	
Other purse seine	+		+		+			+	+	1	+	+	
Saury dip net							267						
Lift nets	45	6	6	+	5	24					+	+	
Gill nets	+				+	+	4	4	2	+	3	6	
Mackerel lining						10							
Squid lining													202
Other lining					3	2		10	2	1		1	
Long lining 2/						+		+		+	+	3	
Set-net 3/ (large)	77	1	5		5	18	6	12	+	1	2		2
Set-net (small)	34	+	4		3	7	1	5	+	+	1		+
Beach seine	2		+	1	+	+		+				+	
Boat seine	38	+	58	53	1	+	+	+			+	+	
Total catch 4/	1,817	49	135	55	83	1,414	278	45	6	9	9	12	213

1/ Excluding tuna usage

2/ Excluding tuna usage

3/ Excluding salmon usage

4/ Including catches by other miscellaneous gear licensing, is considered sufficient.

Large seiners (40 tons and over) are licensed by the Minister of Agriculture, Forestry and Fisheries - as of 1979, there were 322 licensed vessels (11 of which were directed at skipjack and tuna). Since these are vessels of large size, they are forbidden to operate in coastal waters, in order to avoid conflict with inshore fishermen. Medium-sized seiners (5-40 tons) are licensed by prefectural governors but the number so licensed is limited through allocation by the Minister. As of 1979, a total of 1 052 vessels were licensed (368 of 15 tons and over 684 under 15 tons).

Small seiners (under five tons) also are licensed by the prefectural governors - in 1979, there were 283 such vessels in operation. The number licensed is not based on the allowable catch of the target species but simply represents a continuation of the past record. No measures are taken to regulate effort or catch quotas in accordance with variation (increases and decreases) in the fish stocks involved. If restrictions become necessary, as already noted, top priority must be given to protecting the spawning stock. Measures must be imposed to control large-scale fishing in areas occupied by such stocks during the spawning season.

Squid-jigging is a monospecies fishery, directed at squid only. In the waters around Japan, three separate squid stocks may be distinguished: winter born, summer born and autumn born. They differ somewhat in morphology, season of maturity and pattern of migration. Each is divided further into "Pacific" and "Japan Sea" types. Stock compostion is thus quite complex. Since the species have but a one-year life span, prediction of stock size for a following season is impossible. During the 1960s, annual catches ran in the neighbourhood of 500 000 tonnes but have since been on a declining trend with considerable year-to-year variation. In 1977, the catch had dropped to a level of 200 000 tonnes.

The licensing of large squid-jigging vessels (of 100 tons or more) requires approval by the Minister. As of 1979, the number of such vessels totalled 212. They are not allowed to fish in Japanese coastal waters. Medium-sized vessels of this type (30-100 tons), of which there are 2 238 in operation, are also licensed at the Minister's approval. These are prohibited from fishing on the Japan Sea coast and around Hokkaido. Small squid-jigging craft (less than 30 tons) are subject to licensing by the Governor in certain prefectures; elsewhere they may operate without a licence. Since the number of vessels of this class in operation is estimated to be about 30 000, it is difficult to bring them under control. At the present stage, a reduction in the number of medium-sized vessels is considered to be more practicable.

The saury fishery, using stick-held dip nets, is also directed at a single species, although knowledge of the growth of this species is incomplete, it is estimated that the fish taken by this gear are from one to two years old. Because the life span of the species is short, the annual production exhibits wide variation. During the latter half of the 1950s, the yearly catch reached as much as 600 000 tons but the level has dropped gradually to 200 000-300 000 in recent years. Since the decline is not considered to result from overfishing, the imposition of quantitive restrictions on the fishery would be unjustified. The saury fishery is now under the Minister's control and seasonal opening dates are regulated.

Yellowtail is a highly valued fish with a life span of 10-15 years. As in the case of demersal species, therefore, over-exploitation can easily occur. Past catches have shown a gradually rising trend and have been maintained at an overall level of 40 000 tons since 1950. The catch from the Japan Sea also has been stable or increasing but that from the Pacific side of Japan has suffered a substantial decline. This decline is believed to result from the taking of large quantities of larval fish for use in aquaculture. Since 1968, the aquacultural production of yellowtail has surpassed the catch from the natural resource: at 110 000 tons in 1977, the former was triple the latter production. Catch restrictions, based on agreement among fishermen, are in force on the Pacific side but these do not appear to have yielded practical benefits as yet. A serious question thus is raised as to which is the more profitable and rational, to maintain the catch of large yellowtail or to produce more hamachi (young yellowtail) by means of fish culture.

3.2 Management and Utilization of Demersal Species

Unlike the pelagic fishes, demersal fish species generally do not display patterns of long-distance migration. Being less affected by change in the movement of ocean currents, demersal stocks are comparatively stable, although some year-to-year fluctuation usually is observed in catches. The comparative stability is due in part, because of the species' relatively long life span, to year classes being exploited over an extended period, which tends to dampen the annual variation in recruits. Demersal species, however, also are divisible into two groups: one feeding on plankton and the other on benthoic organisms. As plankton feeders sometimes consume crustaceans and other finfishes, this division is based simply on predominant feeding habits.

Plankton feeders, e.g. Alaskan pollock, Atka mackerel and sandlance, are the more mobile and migratory and are found typically in large stocks. This group resembles the pelagic species in some respects. Considerable fluctuation is observable in catches, for example, although not to the extent occurring in the case of abundant pelagic fishes. Benthos feeders such as the flatfishes, in contrast, are of relatively low mobility. Inshore-offshore migration, in accordance with growth and the seasons, occurs in the case of demersal fishes but a north-south movement is not discernable. Even the abundant pollock stocks, therefore, can be managed in a limited areal unit, e.g. in the waters around Hokkaido. Some stocks of the less mobile species may be managed by a group of cooperative associations and nearly all demersal stocks are manageable on the basis of one or a few prefectures.

Since most demersal species are comparatively long-lived, natural mortality must be low. The yield-per-recruit curve thus tends to be dome-shaped. Excessive effort results in a lower catch and a reduction of the size of the fish caught. Pressure on a stock often is revealed by a falling CPUE and poor operating performance prior to the onset of a sharp decline in spawning-stock size. In the case of these species, therefore, yield-per-recruit considerations take precedence and size-limit or mesh regulations become a practical problem before there is serious concern about the stock-recruit relationship.

Some local demersal stocks, particularly those of less mobile species, are easily affected by exploitation. Common symptoms are a decrease in the numbers of larger fish and a drop in the CPUE. Such symptoms have been observed in the case of sea-bream stocks in some districts, of zuwai crab (Chionecetes opilis) in the Japan Sea and kegani or horse crab off Hokkaido. Fishing communities in recent years have become progressively more supportive of conservation for these commercially important species.

The bulk of demersal-fish catches from waters around Japan are taken by offshore trawlers (15 tons or more) and by small trawlers (less than 15 tons) (see Table 7). The species composition varies by area: pollock, sandlance, rockfish, Atka mackerel, sand fish and argentine in the north and sea-bream, croaker, hairtail, sharp-toothed eel and shrimps in the south. In fact, fishing operations generally are directed at a variety of species. Single-species management is not adoptable in this context. Effective management measures for one species may result in unwise utilization of the fish community as a whole. For the management of a multi-species fishery, additional constraints apply. One possible approach is to achieve a maximum catch regardless of the species mix. Another is to place extra weight on commercially valuable species at the cost of sacrificing utilization of others. This is a matter of choice which is left to the fishing industry concerned.

The history of trawling is a record of recurrent disputes with coastal fishery interests. Prolonged debate about a reduction in the number of vessels engaged in this fishery has been associated with continuous improvement in fishing efficiency. Trawling was first introduced in Hokkaido in 1914 and 370 vessels were already licensed by 1922. Their operations had a seriously damaging effect on those of long-liners during this short period and anti-trawling movements arose among coastal fishermen. A nation-wide reduction of the trawler fleet was planned in 1936, not on the basis of stock-size/effort relationship but merely as a means of preventing conflict in the fisheries. During and immediately after the last war, the issue remained in abeyance because of the national food shortage. It emerged again in the 1950s and a number of trawlers were transferred to other fisheries, e.g. those in distant waters (far-seas fisheries). Such transfers were feasible while additional resources and fishing grounds were still available but, under the 200-mile EEZ regime abroad, the opportunity is closed. Demersal-fishery management in

Table 7 Catches of Demersal Fishes by Fishing Gear and Species (1979)

	Flat fishes	Cod	Alaskan Pollack	Atka Mackerel	Red Fishes	Sand Fish	Argentine	Croakers	Lizards	Sharp-toothed Eel
Off-shore trawlers	50 648	15 978	524 599	57 651	11 161	5 434	6 574	333	2 886	2 018
Small trawlers	27 983	1 912	8 941	6 260	1 148	3 173	2 919	2 044	5 109	419
Purse seine				11 627						
Gill nets	35 401	11 089	120 441	23 307	1 870	738		69	11	
Lining	1 376	270	65	793	90			752	1,232	
Long line	1 865	13 810	33 466	875	748			963	62	234
Set net, large	432	534	890	3 021		2	3	11	18	
Set net, small	4 946	569	869	12 902		819		492	131	1

	Hairtail	Skate	Sea Breams	Sandlane	Perch	Kuruma-Shrimp	Crabs	Cuttle Fish	Octopus	Sea Cucumber
Off-shore trawlers	437	210	1 789	36 661		3 528	3 095	405	3 249	
Small trawlers	7 065	622	2 783	3 500	2 027	1 529	1 734	7 137	9 569	6 561
Purse seine					877					
Gill nets	335		92	2	2 001	854	1 543	1 149	1 166	106
Lining	5 855	13	4 883		1 482	1		250	1 396	
Long line	1 116	440	4 871	3	418				6 200	
Set net, large	933	18	755	1 274	359	2	3	163	34	
Set net, small	742	123	1 439	2 755	1 683	57	224	807	508	7

Japan is thus confronted with an intransigent problem.

Urgent steps should be taken for several important fisheries. Zuwai crab in the Sea of Japan are caught by offshore trawlers (about 300 vessels), small trawlers (83 vessels) and craft using crab-pots (15 vessels). This is a very slow-growing species, taking eight years to reach maturity. The stocks are supposed to consist of many small cohorts which are relatively immobile. They are, consequently, highly sensitive to exploitation. In recent years, the total catch has fallen to one-third of the high level reached in 1962-64. The fishery is regulated by the Minister's ordinance, "Enforcement of the Zuwai Crab Fishery in the Sea of Japan", which imposes limits on the fishing grounds and fishing season and on the size of crabs taken as well.

A different crab species, known as beni zuwai, recently has come under exploitation. Under licence by prefectural governors, these are caught by crab-pot vessels. The grounds on which the species is found commonly are fished by fishermen from more than one prefecture, hence joint inter-prefectural management is required. In the absence as yet of such an arrangement, administrative instructions as follows are issued by the Central Government:

i) Not to increase the number of licences above the present level.

ii) To prohibit the catching of female crabs.

iii) To prohibit the catching of male crabs less than nine cm in carapace length.

iv) To limit the harvesting season.

v) To prohibit harvests in waters with a depth of less than 300 m.

vi) To limit the number of pots per vessel

vii) To limit the mesh size of webbing used in pots.

3.3 Management and Utilization of Littoral Species

In principle, common fishing rights are granted to cooperative associations so that local fishermen may have equal access to commonly owned fishing grounds in adjacent waters. These rights are confined to such fisheries as do use designated waters on a common basis. The concept is area dependent, however, and the manner in which the resource is to be managed and utilized is left to each of the cooperatives concerned. Since the resources involved are sedentary, e.g. seaweeds and shellfish, only non-mobile fisheries are subject to common rights. As of April 1979, 5 315 of these rights were in existence. At the same time, demarcated fishing rights within fishing-right areas numbered 12 176. Out of 5 433 coastal villages, 24.6 percent depend mainly on aquaculture (based on demarcated fishing rights). In all, 70 percent of these villages are chiefly dependent on coastal fisheries - only 5.4 percent are supported by large-scale offshore and distant-water fisheries. The great majority of Japanese fishing communities, that is, are sustained by coastal resources and near-by fishing grounds.

Organisms inhabiting beach and littoral zones, e.g. shellfish, sea-urchins, sea-cucumbers and seaweeds, have long been important sources of support for the economics of coastal fishing communities in Japan. As the origin of high-quality products, most are highly valued commercially. In consequence, they have been effectively managed and utilized for many years. Such resources, when the requisite technical and economic conditions are satisfied, become the object of artificial propagation and aquacultural development. Aquaculture at present is based in the main on the species referred to.

The fishery cooperatives vested with common fishing rights are expected to devise and implement their own regulations and administrative procedures. Those favoured with rich natural (sedentary) resources usually develop effective regulatory and enforcement measures. Those lacking sufficient resources nearby or having lucrative offshore fisheries tend to neglect the management of the former. Most cooperatives, however, restrict fishing seasons for the harvesting of seaweeds, shellfish and other littoral organisms. In shellfish (mollusc and crustacean) fisheries, size limits also are usually introduced. Being sedentary and of great commercial value, shellfish are liable to depletion from overfishing. Especially is this so in the case of long-lived species like abalone, top-shell and lobster.

Production from various beach species is being reduced by degradation of the natural environment or habitat and, to ensure a supply for the future, aquaculture is proposed as a means of replacement for the lost wild stocks. There are two types of aquacultural (or maricultural) production, viz. fish farming ("feeding aquaculture") and fish ranching. In the former, i.e. farming, naturally or artificially raised larvae of such species as yellowtail, sea-bream and prawn (Penaeus) are reared to maturity in sea-ponds. In ranching, the larvae are released to the sea for later harvesting. Salmon propagation is the typical example of the latter technique but sea-bream, shellfish and seaweeds also are cultivated in this way. There has been a notable increase in aquacultural production in recent years, although the number of species involved is still limited. For certain species, e.g.yellowtail, scallop, oyster and wakame seaweed (Undaria), production from aquaculture now exceeds that from natural stocks. Cultured scallop production in 1977 was about double and that of wakame seaweed five times that of the natural crops. Cultured production of larvae,at 280 000 tonnes, has given rise to a problem of over-supply.

These aquacultural operations already are intertwined with those of the coastal fisheries and play an important economic role therein. With reference, therefore, to the implementation of common fishing rights and related issues, production plans must include the supply potential of aquaculture. Examples of coastal waters being effectively utilized through successful aquaculture operations are reviewed below.

a. The Case of the Scallop Fishery in Sarufutsu, Hokkaido

The village of Sarufutsu faces the Sea of Okhotsk and possesses a wide common-fishing-rights area based on a coastline 33 km long. This area has long been an excellent fishing ground for scallop but, as a consequence of unregulated exploitation, production declined to a point where (in 1955) the fishery was no longer viable. As a countermeasure, a total ban was imposed on the entire area from 1965 to 1971. The resource failed to recover, however, and the local cooperative association agreed in 1970 to adopt positive measures for resource restoration. During the 1971-74 period, the cooperative released quantities of larval shells, transported from other prefectures, and, by 1974, harvesting activity could be resumed. Four years later, a production level of 16 000 tons was achieved.

Throughout the period, the catch was subject to quota and the fleet operated according to prescribed rule. The grounds are fished in accordance with a five-area rotation arrangement and, prior to the release of larval shells, all fishing vessels are required to join in cleansing the grounds of starfish (the natural scallop predator). All profits are pooled and distributed on the basis of shares keyed to both catch records and contributions to the fishery. On the average at present, the highest earnings of fishermen in this village are realized exclusively from the scallop fishery.

b. The Case of the Habomai Fishery Cooperative, Hokkaido

In prewar days, this cooperative association had abundant resources around the Habomai Islands but, since 1946, those islands have been under Soviet occupation. Many of the islanders were moved to Hokkaido with only the clothes on their backs to make a new start. Their main activities then were focused on seaweed (Laminaria) harvesting and the salmon fisheries with set-nets and gillnets. More recently, with the development of transportation, sea-urchin have gained in market value. These fishermen also engage in flounder fishing (with gillnets), saury fishing and squid jigging. In monetary terms, however, salmon still accounts for half of total revenue.

The beach-area fisheries are self-administered, with operations allocated among members of the cooperative. The fisheries subject to management include not only those under common fishing rights but also those licensed by the Governor of the Prefecture. They are collectively reallocated for management purposes as follows:

i. Basic fisheries. (Participation in the seaweed harvest is limited to a imum of 900 persons.)

ii. Common fisheries, i.e. fisheries of low profitability. (A fixed number of participants is allowed in each such fishery but fishing operations are unrestricted otherwise.)

iii. Fisheries subject to partial restriction. (Because of limited resources, overlapping participation in these fisheries is not permitted.)

iv. Regulated fisheries, i.e. those with a relatively high degree of profitability. (Persons operating in one of the fisheries must accept severe restrictions on participation in other fisheries.)

All allocations by the cooperative are based on "fisheries approval policy". Set-net and other licensed fisheries, as well as those under common fishing rights, are included. The following are the benefits expected from self-management of this sort:

i. The number of operators can be adjusted to fit the capacity of the resources available.

ii. Opportunities to participate in a fishery can be dispensed equally and income differentials thereby narrowed.

iii. Poaching can be prevented, by mutual surveillance - since all members participate in the salmon fishery, in some form; there are virtually no illegal activities on the part of any member, and

iv. Operations in the fisheries are stabilized.

c. Management of the Hen Clam Fishery in Isobe, Fukushima Prefecture

The hen-clam fishery of Isobe village has a long history. In 1963, following a shift from hand-reel to automatic-reel operations, the catching effort intensified with a resultant reduction in the resource. Thus, from a catch of 400 tons in 1967, there was a decline to 30 tons in 1972. Since 1973, however, annual production has been stabilized by effective management of exploitation of the dominant 1971 year class. Because 4-5 year-old clams are highest in commercial value, that year class has been basic to the harvest since 1976. An assessment of the stock is made in June of each year by the Fishery Experimental Station and it has been determined that the stock size, from 234 tons in 1973, increased to 350 tons in 1974, to 525 tons in 1975, to 700 tons in 1976 and to 2 450 tons in 1977, then decreased to 1 225 tons in 1978. This trend reflects an increase in the biomass by the growth of individual animals.

The annual quota for the harvest is set, by the cooperative in consultation with the vessel-owners group, prior to the fishing season. To prevent the fierce competition for shares in the catch that could result from the introduction of a quota, a joint operating arrangement has been created by which profits are distributed equally among the fishermen. During the fishing season, daily operations are directed by the head of an Operations Committee, who is elected on a rotating basis. Instructions cover the number of crew members per boat and operating time. Under-sized clams must be returned immediately to the sea. While application of this approach has effected a rational utilization of a given year class, enhancement of the species stock has yet to be accomplished.

4. SOCIO-ECONOMIC CONSIDERATIONS IN FISHERY MANAGEMENT

The concept of fishery management encompasses more than simply resource management as described above. Fishery management, through the control of fishing activity, seeks not merely to ensure the most favourable stock conditions for achieving a maximum sustained yield (MSY) in the biological sense but rather to obtain a maximum economic yield (MEY). Thus, in practice, the objectives of management are based not only on biological considerations but also on the socio-economic aspects of the fishing industry.

A review of the historical development of the Japanese fisheries reveals that, in the earlier stages when resource management was not yet a serious concern, disputes over the utilization of fishing grounds were frequent. These disputes tended to be of two types: those involving fishermen's groups from different localities and those involving different fisheries in the same locality. In both cases, settlement of the conflict and the normalization of fishery operations were important tasks for administrative agencies. The disputes originated in various socio-economic problems, e.g. those relating to demand/supply relationships in product markets, to production cost vs. market price, to inequality in productivity between villages and to the unbalanced development of fishing villages.

Fishery management includes the type of adjustment measures referred to, aimed at rationalizing the fisheries by taking into account social as well as biological factors. In its original form, at a time when productivity (with unmotorized vessels) was relatively low, Japanese fishery management was concerned with the settlement of disputes arising from dependence on limited resources and fishing grounds. With the advance of fishing-craft motorization and the consequent rise in productivity, the nature of disputes changed and resource husbandry became an important issue. The fishery-management system has evolved in response to these developments.

Management action normally is required in situations where the demand for a product or products derived from a particular fishery resource exceeds the supply potential. In such circumstances, if there were not an appropriate management programme, new investment to expand fishing effort on the resource would take place. While this might lead temporarily to an increase in supply, production eventually would start to fall. From the standpoint of rational resource utilization, therefore, effective fishery management is vital. If the process is viewed in an economic context, the additional investment in this instance ultimately would have a negative impact. From a socio-economic point of view, a primary objective of fishery management is elimination or minimization of wasteful investment activity of this kind - some such investment may not always be avoidable.

The most effective management method is to set up catch quotas. There are two approaches to the application of quotas, one of which is to establish total allowable catch limits within which fishermen can operate freely. This is often called the "Olympic system". The other approach is to allocate quota shares to individual vessels. The first approach is effective in expediting fishing activity through technical improvement. It results in a shorter fishing season, however, in a sharp decline in the rate of return on capital and ultimately in very low profitability. If shares in the quota are allocated, on the other hand, the allocation per vessel progressively shrinks as newcomers enter the fishery. If entry is restricted, however, there is no incentive for improving efficiency and the fishery stagnates.

Preferred approaches to fishery management involve the rationalization of both resource exploitation and capital investment. In this direction, Japanese management approaches have been reasonably successful. The principal management technique employed in Japan is the restriction of total fishing effort. In establishing total eligible effort, the aggregate gross tonnage of fishing vessels is determined in the first place, so that fishing effort may correspond to resource availability on the one hand, and on the other reflect the magnitude of the capital being invested in the fisheries. Gross tonnage is the basis upon which the number of vessels licensed for particular fisheries is determined.

This approach is less effective than direct measures like catch quotas. Since it is often difficult to obtain a definite estimate of allowable catch, however, such stricter approaches are not always implementable. Moreover, a limitation on the number and size of fishing vessels is more easily enforceable than other measures.

In determining the number of vessels to be licensed, the total capital investment is evaluated and distributed by size-class of vessel. In licensing, priority is given to those with a past performance in the fishery in question and newcomers are strictly limited. Technical innovations are permitted so long as the size of vessel remains unchanged. When vessel size must be enlarged, extra tonnage must be purchased from other licence holders who are retiring from the fishery. Thus, as fishing methods have improved in efficiency, the number of licensed vessels gradually has been reduced. To ensure that the total operational efficiency of a fishery does not exceed the prescribed ceiling, plans for the enlargement of vessel size are carefully coordinated. A group wishing to enlarge a vessel by 70 gross tons, for instance, are required to abolish a licence for a vessel of 100 gross tons. In this way, the Japanese system has managed to control overall fishing effort and to prevent an inflow of over-investment and, at the same time, to lead the way toward improvement of efficiency in the fishing industry.

Although the profitability of a fishery varies in the main in accordance with market-determined demand/supply and cost/price relationships, effective fishery management (by limiting the supply of fish) tends to generate excess profits which, in turn, motivate additional investment in the fishery affected. To offset this tendency, special rights for participants are created in the form of licences and permits. With a view to making use of excess profits for fishery-management purposes, provision was made in drafting the present Fisheries Law for the collection of fees for licences and permits. Owing to strong opposition from the fishing industry, however, this provision was deleted. The principle of priority for past performance in a fishery and the general prohibition of trading in licences and permits, contained in the Law, are designed to prevent an outflow of the excess profits mentioned from the fisheries to other sectors of the economy.

The Japanese system of fishery management seeks simultaneously to improve fishery production and to democratize fishing communities. Although undemocratic practices had prevailed in the fisheries earlier, the conviction eventually emerged that the harmonious utilization of resources and the management of fisheries through democratic planning and cooperation by fishermen themselves would be most effective in achieving a high level of production from the coastal waters of Japan. The basis of the new system was thus established.

Fishermen are highly organized in Japan. Almost all are members of cooperative associations based either on local communities or on types of fishery. To ensure democratic operation, cooperative structure and activities are stipulated in the Fisheries Cooperative Law. These cooperatives play a very important role in the implementation of fishery management, as already indicated. They act as the managing agency in the fishing-rights fisheries. In the licensed fisheries, they collaborate with the responsible administrative agencies in achieving effective implementation of management measures. Representatives from the various levels of cooperative organization are core members of the local, regional and national fishery coordination bodies.

Japanese fisheries have developed sequentially from coastal to offshore to distant (far seas) waters. This implies that potential fishing effort always has been out of proportion to the available resources. All fisheries, therefore, had to be placed under a management (regulatory) regime at an early stage of their development. Under these conditions, the exploration and extension of fishing grounds have been concomitant with a shift in fisheries composition. The exploration of new fishing grounds usually is initiated via experimental operations. If the results of these operations are promising enough to support a new fishery, and the intention is to incorporate this in the development of existing components of the industry, the exploratory phase should give way to an operational one at a fairly early stage. The qualifications for and conditions of participation should be established and proclaimed at the same time. When the new fishery is placed under licensing regulation, surplus effort in other fisheries is preferentially transferred to it. The initial number of licences is determined in the light of actual fishery operations and, if justified, gradually increased thereafter.

The history of offshore trawling is typical of the evolution of a fishery under the licensing system. In 1951, the total effort in the trawler fishery was excessive, with 2 836 vessels licensed and the average catch per vessel being 29 tonnes. Since that year, effort has been transferred from this to other fisheries as the opportunity arose. During the developmental stage of the longline fishery for tuna, 111 trawl-fishing vessels were transferred to that fishery. When the high-seas salmon fishery commenced in the northern part of the North Pacific, 318 vessels were moved to it. A further transfer of 126 vessels took place when distant-water trawling was permitted in the Bering Sea. With the licensing of distant-water trawling in southern waters, 50 tons of offshore trawling capacity had to be abolished. Through these repeated transfers, the number of vessels in the offshore trawl fishery was reduced to 810. Over the period, while the total annual catch in the fishery declined to 64 000 tonnes (from 81 000 tonnes), the catch per vessel rose to 82 tonnes.

Since the establishment of EEZs, owing to the reduced availability of resources and fishing grounds (along with rising energy costs), some branches of the Japanese fisheries have become severely depressed. In an attempt to cope with such adversities and to improve the CPUE, it has been necessary to reduce the total effort in these branches. When the number of vessels in a fishery has to be reduced, compensatory measures of various kinds are provided. Although the Fisheries Law guarantees fishermen full compensation by the government for vessels withdrawn during a valid licence term, no such occasion has arisen so far. Several forms of compensation, however, were made available following the drastic reduction in fishing activity caused by extensions of fishery jurisdiction abroad, when more than 1 000 units of the Japanese fleet were laid off. For instance, the government covered deficits incurred during the lay-off period and the cost of demolishing the vessels. Although the general rule was that, under a mutual scheme, the cost of compensation for this purpose would be borne by the fishermen remaining in the fisheries, the government (taking into account the ability of the remaining fishermen to pay and progress in the abolishment plan) subsidized the compensation fund.

In the case of a reduction of fishing effort to improve profitability in a specific fishery, the government facilitates reorganization of the fleet as necessary for the purpose, even when this involves the extinguishing of licences for vessels representing investments made entirely at the owner's risk. The remaining fishermen are completely responsible for the payment of compensation in this case. In obtaining the necessary funds, however, they are supported by the government through the provision of loans and a subsidy on interest charges. These arrangements have worked quite well and are now being integrated into the fishery economy of Japan.

The leading concern in Japanese fishery management has been coordination of the activity of a majority of the fishermen involved in the various fisheries of the country. The objective of coordination has been the democratic and harmonious allocation of fishing effort in balance and conformity with the productivity of fishery resources. New entry into any fishery generally has been restrained and the fishing efficiency of existing vessels has been cautiously controlled, i.e. it has been allowed to increase only when a "vacant space in the room" has been created by a reduction in the number of fleet units.

The socio-economic status of the Japanese fisheries has worsened in recent years, due mainly to the oil crisis but partly also to general cost increases and to the contraction of fishing grounds resulting from extended fishery jurisdiction by foreign countries. To cope with this problem, Japanese fishermen have adopted new approaches to management, including an autonomous programme to reduce licences/vessels in each fishery, the purpose being to raise both the overall profitability of the fishery and the returns to individual fishermen through improved fishing efficiency.

The major function of fishery management in Japan thus has been the establishment of various types of restraint, e.g. those on fishing gear and methods and on the scale of fishing vessels. Motorized craft, for example, are still prohibited in the common fishing rights fisheries of some coastal waters. Technological progress in the Japanese fisheries, therefore, has been under strong constraint. The position of fishery technology in Japan, then, may be somewhat distorted in nature in comparison with that of other industries and of fisheries in some other countries. In other words, with reference to applied technology and economic productivity, a good deal of irrationality is to be found in the fisheries in Japan.

The internal structure of the Japanese fisheries, however, appears to be sound enough from a socio-economic point of view. Fishermen's incomes on the average have been about equal to those of workers in other large industries and fishery enterprises have earned adequate profits. The characteristics of the fisheries in Japan, as outlined in the foregoing, have been determined largely by the Japanese system of fishery management - its principles, structure and functions - which, therefore, must be considered so far a fair success.

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